

CLAIMS

1. A circuit connecting material which is used to connect a first circuit member in which first circuit electrodes and first insulating layers are formed adjacent to each other on the main surface of a first circuit board, and a second circuit member in which second circuit electrodes and second insulating layers are formed adjacent to each other on the main surface of a second circuit board, with at least some of said insulating layers being formed such that these layers are thicker than said circuit electrodes on the basis of said main surface in at least one of said first and second circuit members,

wherein said material contains a bonding agent composition and conductive particles which have a mean particle size of 1 μm or greater but less than 10 μm , and a hardness of 1.961 to 6.865 GPa; and

said material exhibits, when subjected to a curing treatment, a storage elastic module of 0.5 to 3 GPa at 40°C, and a mean coefficient of thermal expansion of 30 to 200 ppm/°C at from 25°C to 100°C.

2. The circuit connecting material according to claim 1, wherein said conductive particles comprise a core body made of an organic polymer, and a metal layer made of copper, nickel, a nickel alloy, silver or a silver alloy which is formed on the surface of said core body, and the thickness of said metal layer is 50 to 170 nm.

3. The circuit connecting material according to claim 1 or 2, wherein said conductive particles comprise an outermost layer made of gold or palladium, and the thickness of said outermost layer is 15 to 70 nm.

5 4. The circuit connecting material according to any one of claims 1 to 3, wherein said bonding agent composition contains an epoxy resin and a latent curing agent for said epoxy resin.

10 5. The circuit connecting material according to any one of claims 1 to 3, wherein said bonding agent composition contains a radical-polymerizable substance, and a curing agent which generates free radicals when heated.

15 6. The circuit connecting material according to any one of claims 1 to 5, wherein the glass transition temperature is 60 to 200°C as a result of the curing treatment.

 7. The circuit connecting material according to any one of claims 1 to 6, wherein the material further contains a film forming material.

20 8. The circuit connecting material according to claim 7, wherein said film forming material is a phenoxy resin.

25 9. A film-form circuit connecting material which is formed by forming the circuit connecting material according to any one of claims 1 to 8 into shape of a film.

10. A circuit member connecting structure comprising:

5 a first circuit member in which first circuit electrodes and first insulating layers are formed adjacent to each other on the main surface of a first circuit board;

a second circuit member in which second circuit electrodes and second insulating layers are formed adjacent to each other on the main surface of a second circuit board; and

10 a circuit connecting member which is disposed between the main surface of said first circuit member and the main surface of said second circuit member for connecting said first and second circuit members to each other;

15 at least some of said insulating layers being formed so that these layers are thicker than said circuit electrodes on the basis of the main surface of the circuit board in at least one of said first and second circuit members,

20 wherein said circuit connecting member contains an insulating substance and conductive particles that have a mean particle size of 1 μm or greater but less than 10 μm , and a hardness of 1.961 to 6.865 GPa;

25 the storage elastic module of said circuit connecting member at 40°C is 0.5 to 3 GPa, and the mean coefficient of thermal expansion of this member from 25°C to 100°C is 30 to 200 ppm/°C, and

said first circuit electrodes and said second circuit electrodes are electrically connected via said conductive particles.

11. The circuit member connecting structure according to claim 10, wherein said conductive particles
5 comprise a core body made of an organic polymer, and a metal layer made of copper, nickel, a nickel alloy, silver or a silver alloy which is formed on the surface of said core body, and the thickness of said metal layer is 50 to 170 nm.

10 12. The circuit member connecting structure according to claim 10 or 11, wherein said conductive particles comprise an outermost layer made of gold or palladium, and the thickness of said outermost layer is 15 to 70 nm.

15 13. The circuit member connecting structure according to any one of claims 10 to 12, wherein, in the circuit member(s) in which at least some of said insulating layers are formed with a greater thickness than said circuit electrodes on the basis of the main surface of said circuit
20 board, the difference between the thickness of said at least some of the insulating layers and the thickness of the circuit electrodes is 50 to 600 nm.

25 14. The circuit member connecting structure according to any one of claims 10 to 13, wherein the glass transition temperature of said circuit member is 60 to 200°C.

15. The circuit member connecting structure according to any one of claims 10 to 14, wherein said insulating layers are constructed from one of an organic insulating substance, silicon dioxide and silicon nitride.

5 16. The circuit member connecting structure according to any one of claims 10 to 15, wherein, in at least one of said first and second circuit members, the surface area of said circuit electrodes is $15,000 \mu\text{m}^2$ or less, and the mean number of conductive particles between said first
10 circuit electrodes and said second circuit electrodes is 3 or greater,.

17. The circuit member connecting structure according to any one of claims 10 to 16, wherein, in at least one of said first and second circuit members, said circuit
15 electrodes have a surface layer constructed from gold, silver, tin, a metal of the platinum group or indium tin oxide.

18. The circuit member connecting structure according to any one of claims 10 to 17, wherein, in at least one of said first and second circuit members, said circuit
20 board is constructed from an organic insulating substance, glass or silicon.

19. A method for manufacturing a circuit member connecting structure which comprises a first circuit member in which first circuit electrodes and first insulating layers
25 are formed adjacent to each other on the main surface of a first circuit board, a second circuit member in which second

circuit electrodes and second insulating layers are formed adjacent to each other on the main surface of a second circuit board, and a circuit connecting member which is disposed between the main surface of said first circuit member and the main surface of said second circuit member for connecting said first and second circuit members to each other, at least some of said insulating layers being formed so that these layers are thicker than said circuit electrodes on the basis of the main surface of the circuit board in at least one of said first and second circuit members,

said method comprising the steps of:

interposing the film-form circuit connecting material according to claim 9 between the main surface of said first circuit board and the main surface of said second circuit board, and

curing said circuit connecting material by the application of heat and pressure via said first and second circuit members for thereby connecting said first circuit member and said second circuit member, so that said first circuit electrodes and said second circuit electrodes are electrically connected via said conductive particles.